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A Conservation Teaching Aid

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A Fifth Grade Studies the Results of a Forest Fire

U. S. Department of Agriculture Forest Service

CONTENTS

	Page
Teacher and Pupil Purposes and Planning	1
Organization of the Field Trip	3
Class Questions Asked and Answered on the Field Trip	6
Field Trip Follow-up	7
Contour Map of Woodwardia Fire Area	8
Organization for Culminating Report	10
Program for the Woodwardia Fire Report	12
Appendix	16

THE WOODWARDIA CANYON FIRE

A Fifth Grade Studies the Results of a Forest Fire

By---------

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ay Borges — SANTA BARBARA NEWS-PRESS

Fire! The word was all too real that hot Fall afternoon to the children of Paradise Canyon School. They saw tongues of flame here and there through the thick smoke pall covering the mountains just back of their school. There was the frightening acrid smell and queer reddish cloud which accompanies forest fires. Wood ash drifted everywhere. It was thick as new snow on the playground. Even thicker were the rumors. Although these children lived on the outskirts of a great city backed up against the mountains, some of them had already been evacuated from their homes. The tension continued as the fire raged out of control and swept across the main mountain highway, up other canyons and over high ridges. At last the good news came. The fire was under control!

Readers may wish to know how one teacher made use of a situation which erupted on her doorstep.

TEACHER AND PUPIL PURPOSES

For the teacher the purposes of the study were to:

Develop within the children positive attitudes and clear insight relative to the need for conservation of our natural resources.

Teach specific information relative to one aspect of conservation (forests and watershed).

Provide a meaningful vehicle for the development of group and individual skills.

The pupils wanted to find out all about the fire in the mountains behind their school.

PLANNING

The teacher determined to make maximum use of the forest fire which occurred in the mountains behind the school. She surveyed possible sources of information, and made a tentative plan of study.

The pupils planned with the teacher the things they wanted to find out.

What caused the fire?
How big was it?
What did it do to the forest?
Who fought the fire?
How did they fight it?
What damage was done? Can it be repaired?

What will it cost?
How will the fire affect us?

They also planned how to secure desired information and set up machinery to do so.

Every fall during the fire season, the captain of the local County Fire Department had come to the school to talk about the Junior Fire Department Program. This year his visit came just after the news of the fire containment. The children had a great discussion with him about his experiences on the fire. The stories which went home elicited the offer from one parent of the preview of a new film on aerial fire fighting. The film proved to be an excellent means of showing scientific methods of research and the operational use of chemicals.

The children became interested in such topics as:

The costs of all fire operations and services.
The necessary manpower, manhours, and even loss of life.
The terrific waste of such natural resources as lumber, watershed, ground cover, wildlife, as well as food and shelter for survivors.
Altered stream flow.
Loss of beauty, of scenic areas, of camping and picnic spots.

New vocabulary grew by leaps and bounds. Since it was very important to keep the discussion moving and ideas flowing, the children were not asked to write the topics. The discussion turned to ethics. The children said,

"How easily people forget!
"Is this right?
"Should we forget it and think it doesn't matter?"

The children were coming to see the importance of social conscience — that things and events DO MATTER.

There were infinite possibilities for development on the topic of waste. For instance, creative writing and research possible for a child who imagined himself to be a ground squirrel who kept a "diary" during the two weeks of the fire. Another was a mountain lion returning to the area looking for its home.*

* (The reading linked with creative thinking and writing justifies any childlike border-crossing into animism.)

The class discussions also led children to think and look at the fire from other viewpoints, e.g., as a squirrel, an ant, a bird, a stream, a chaparral shrub, and so on.

Conclusions that everything was worse after the fire led the children to consider how people might be affected. They asked:

"How will it be on the burn next summer?"

It was no problem then to build up curiosity about what it was like "up there." Someone suggested the only way to find out was to go and see so a field trip was planned. We asked who had visited the area before the fire. Then we asked who usually went there in the summer. Could they go to the fire area for camping this summer? Why? Would there be any drinking water? Maybe taps and pipes are burned and streams dried up. We couldn't see everything, so we'd better ask the Ranger!

ORGANIZATION OF THE FIELD TRIP

Inventory

We talked about what we already knew about soil. Using soil around the school we began by doing the experiments described in the text books. We studied:

Origin of soil and bedrock
Soil structure and composition
Soil aggregates and compaction
Organic matter, microorganisms
Depth variations of soil layers
Soil temperatures
Soil testing; acid — alkaline reaction

We had already learned about the importance of soil. We had played detective with many things tracing their source back to the soil. The children tried to find things that could not be traced to some connection with soil. The children were amazed to find their total dependence on soil. This "sleuthing" was popular with the children.

Mechanics of the Trip

I had talked with the principal about the whole project. He assured me of his fullest support and we certainly envisaged a field trip. The children never realized that much of this whole project had to have quite a bit of form before they began to plan. For example, although I called

the District Office ahead of time to reserve a bus, the class appointed a child to write the principal for permission to make the trip and to request the bus.

The class recognized the serious purpose of the trip. They quickly eliminated as inappropriate any ideas of picnics, of taking pictures of friends. They compiled a list of things they really wanted to see, test, ask about, collect, and photograph. This was placed on a chart as follows:

Field Trip

Experiments	Collections	Questions	Photographs	Ranger Interviews
Topsoil depths				
Acid/alkali				
Growth (chaparral soil				
(burned soil				
New growth				
Splash erosion				
Soil temperature				
Living things				
Soil compaction				
Air in soil				
Wind directions				

The children's questions were written as they thought of them and then organized into related areas. Three or four recorders taking turns saved time and held interest.

The class requested the teacher to duplicate a copy of all plans for each child. (See Appendix A) Sample worksheet for use on field trip.

Next day each child was given time to choose a question or experiment.

Each child was responsible for preparing his equipment. Collection bottles were labeled, tools secured, and thermometers packed. Clipboards were made with clothespins and cardboard. Pencils were tied on. Masking tape and India ink made moisture-proof labels. For example:

Soil under chaparral for Growth Experiment Greg

Burned soil for Growth Experiment Russell

Chaparral litter for Growth Experiment Harly

The children formed into three groups. Each group invited a qualified adult (school principal, supervisor, class teacher) to accompany them. Each group had an "official" photographer (child) and a "floater" (child) to tackle unforeseen problems. Someone suggested that we should plant a tree in the burned area. Through the courtesy of a Forest Ranger at the nearby Oak Grove Ranger Station, we secured a knob-cone pine seedling to plant on the burn. We decided our visit to the burned area should be planned as follows:

Class discussion with Forest Rangers
Field study for small groups
Official tree planting

The Trip Itself

Three Forest Rangers met us at Clear Creek Ranger Station. We sat down in a big circle while the rangers used a large Forest Service map to show the location of the station in relation to the burned area and the remainder of the forest. The strategy for locating the station and the fire access roads was explained.

Next the children asked their prepared questions. The answers brought forth many more questions. The rangers were impressed with the quality and range of the pupils' ideas. The men quickly recognized that they need not simplify their answers; that extensive study had preceded the trip. The conversation lasted about a half hour. Some of the questions and answers follow:

Sample Class Questions Asked and Answered on the Field Trip

Questions	Answers
How are permanent water tanks filled?	Water tanks are filled by spring water, by rains, by water hauled in tank trucks.
How did the fire-fighters get heavy equipment up slopes?	They took equipment to unloading points along the roads nearest the fire area by truck. Bulldozers were unloaded from the trucks and driven up the ridges. They pulled other heavy equipment.
What are some ways the foresters will try to stop the bare soil from washing and blowing away?	They sow seeds to grow plants to help hold the soil. Most of the seeds are mustard and rye grass. They will build a few dams but that costs a lot of money.
Why did we get such large ashes, burned leaves, etc. falling on our schoolyard?	The smoke and heat lifts the leaves and ashes and the wind blows them. Then the heat cools and the leaves and ashes fall.
What are the most obvious results of this fire?	The most obvious results of this fire are that the watershed cover is gone and the beauty of the chaparral is gone. There is also the danger of floods to those who live below the mountains where the fire burned.
What type of fire was it and how did wind affect it?	The fire was a surface fire. The winds blew the flames in several directions and made them burn for quite some distance. This made it hard for the fire fighters to move some of the equipment.
How did the fire damage the watershed?	The fire burned the brush and trees; the rains came, all of the natural rivers and streams clogged with mud.
What effects might this have?	We lose water that should normally sink into the soil to be stored. Eroding soil filled flood control reservoirs and in some places clogged city streets.
What will be the first animals and plants to return to the fire area?	The first animals to return to the fire area will be rabbits, squirrels, and a few animals whose homes had been missed by the fire. The plants that came back first are some of the plants that sprout after a fire, like a chamise plant. Some of the plants that were not burned by the fire may have had their seeds blown into other areas to start new plants.
What are the less obvious results of this fire?	Topsoil was blown away. The fire burned food for animals and killed insects. Flood waters will pollute streams and silt up the reservoirs and dams. Plants and animals in the polluted water will die.
What is a watershed?	A mountain slope from which water runs into streams, lakes and reservoirs.
How long would it take to replace the forest (that burned) grow back?	A few of the plants had already started to grow back a little, but it will take 10-20 years for the forests to grow back fully.
When and where was the fire first discovered?	It was first discovered at 12:02 a.m. at Dark Canyon the lookout tower on the mountain.
If the soil burns can it grow plants again?	Organic matter in the soil burns. It can grow plants again.
Does the chaparral-type ground cover help the fire advance quickly?	Yes, because of the oils in most chaparral plants and also because of its habit of growing close together.

When it was obvious that the children wanted to scatter and begin first hand observations a ranger went with each group. A scientist from nearby California Institute of Technology, who had learned of our study, observed and participated in each group in turn.

The children clambered over the charred slopes. They felt the loosened soil slipping under their feet. They found blackened bones of animals trapped in the fire. Jan called, "Look, I've found some erosion starting." Although the chaparral had been seared by flames, the children discovered tiny green sprouts growing at the base of the blackened, antler-like old stems.

The searching was both methodical and spontaneous. The children seemed quite well equipped to understand and appreciate the immediate and long range effects of a forest fire.

After about half an hour, the groups gathered for the tree planting. The children had planned the ceremony and the rangers watched with interest. Then we climbed aboard the bus with all our collections and ideas and headed back to school.

FIELD TRIP FOLLOW-UP

Immediately after the trip, without any class discussion, the children were asked to write very briefly on small cards their most vivid impressions in any way they chose. The children were invited to read these aloud to compare impressions.

All collections and materials were placed on tables previously designated and cleared. Children gathered around and shared their "finds." An appointment sheet was set up for children to sign when they were ready to do an experiment and report to the class. A period each afternoon was set aside for this.

As the class watched and listened, there was cumulative information and improvement. The need was recognized for a group lesson on recording experiments to answer such questions as:

What do we want to find out? (Purpose)
What do we do and what do we need? (Procedures and materials)
What happens? (Results)
What does this tell us? (Conclusions)

Instead of the typical rigid form for recording experiments each child summarized his findings on cards in an informal way.

Experiment carried out by: Janet

To find out: How deep the topsoil was where the chaparral had burned and where it hadn't.

Method: I pushed a foot-long nail into the topsoil. When it reached the bedrock, I took the nail out and measured it. Sometimes the nail wasn't long enough to go down all the way to the bedrock, so the topsoil was over a foot deep.

Result:

Burned sloped land	Unburned sloped land
1. 7 inches	1. 11 inches
2. 8 inches	2. over 1 foot

Conclusion: Topsoil was deeper where the bushes hadn't burned because the rain couldn't wash it away.

Many pictures and booklets were brought in during the reports and experiments. A committee organized these on a rack.

Better written and oral language resulted from the need to communicate. Individual pupils were chosen to write letters of request and letters of appreciation to the more than two dozen people who gave assistance.

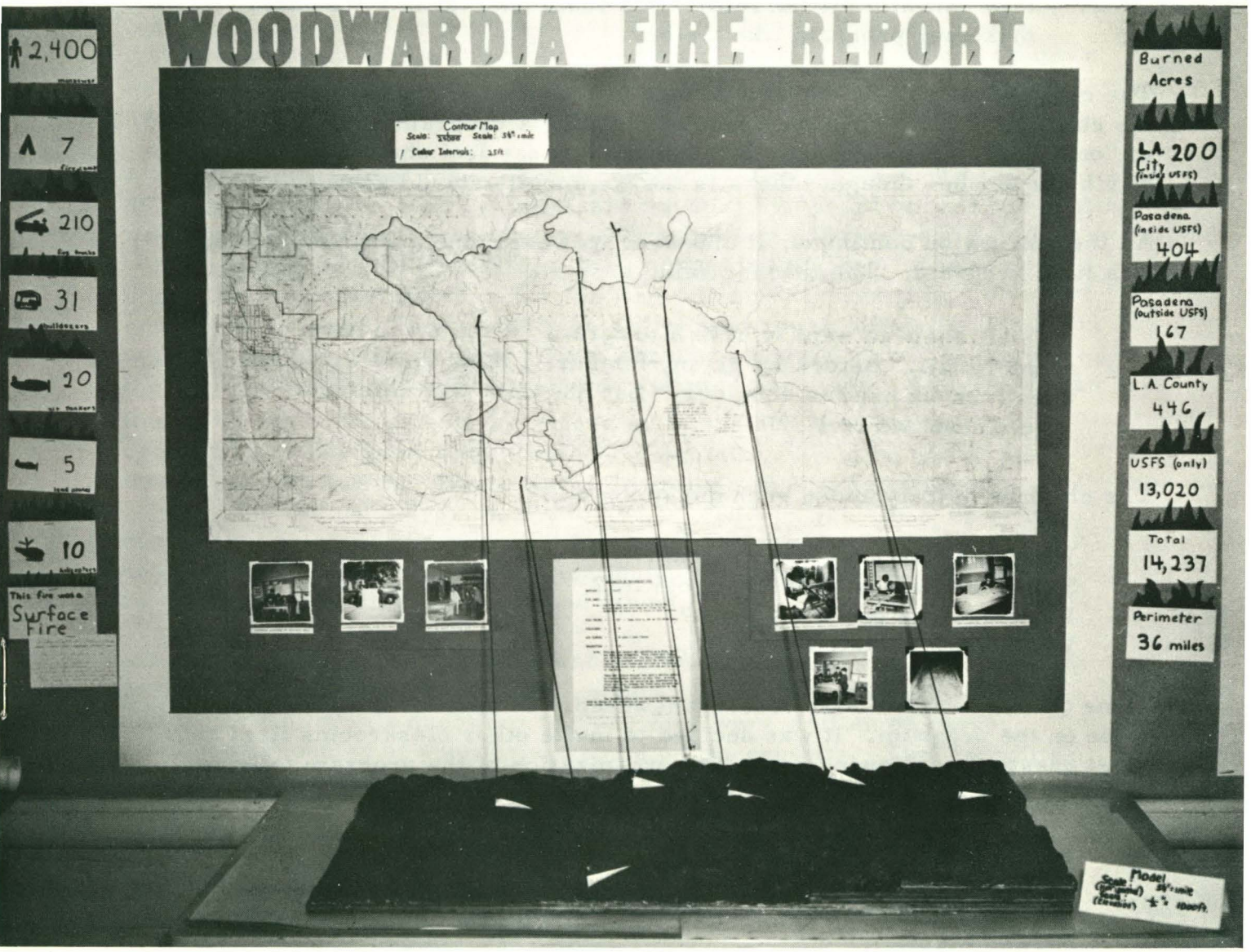
Charts were developed by interested groups who presented reports to the class.

Contour Map of Woodwardia Fire Area

One of the most impressive reports was given by three boys who decided to make a relief map of the fire area. They started with the U. S. Geological Survey map used by fire agencies to map fires. Three boys traced the 2000', 3000', 4000', and 5000' contours onto an acetate overlay using different colors for each level. Separate patterns were made for each level on four acetate overlays, and the peaks of all mountains were located. The scale was set at 1/2" for each 1000' of elevation. The acetate patterns were cut out and the outline of templates traced on 1/2" plywood. The pieces were cut out like a jig-saw puzzle; then each piece was completely covered with shellac to prevent warping, assembled correctly in contour layers, and tacked together.

After experimentation, a mixture of asbestos flakes and starch was decided upon as the media for shaping land surface features. When the model was dry the fire area was traced on and painted brown. The non-burned area was painted green. Roads were indicated with a red line. Pinned flags marked important points, such as Mt. Wilson, Mt. Disappointment, Dark Canyon and Paradise Canyon School.

Making this type of map required research skills, meticulous hand skills, and perseverance. Not many children could have made such a fine model. Few adults could achieve better results. It is to be noted that the children who worked on the map chose the task, planned their procedures, and evaluated their work. To the teacher the finished product, excellent though it was, seemed less important than the growth of the children.



Organization for Culminating Report

The children's enthusiasm and interest in the study spilled over into their homes and into other classrooms. We began to hear such remarks as:

> "My mother wants to see our map.
> "My dad keeps asking me questions about the fire.
> "A lot of people want to know more about what we're doing. Could we have a sort-of open-house and show them our things? They look kind of messy and crowded right now. We'd have to straighten them up a bit.
> "The reports were so interesting and we still have our notes. Couldn't we re-polish our reports and give them again?
> "There ought to be someone to tie the reports together. On TV they call him the narrator. We could take turns. We could make our program like a story."

The children wanted to share what they had learned. The teacher wanted the children to have the experience of planning a program and speaking to "outsiders." The children had learned a great deal about conservation which the teacher thought others in the community should know.

As the discussion continued, it appeared that everyone accepted the idea of a final program. The teacher said,

> "We all seem to want to have a program. I think you have much to tell. Before we go any further, I think there are some questions we need to consider. Let me start with this one. Whom shall we invite?"

The children quickly added such questions as:

> When shall we have our program?
> Should everybody be in the program?
> What shall we tell our guests?
> Which shall we tell when?

Some questions were fairly easily answered. Of course everyone wanted to be on the program. It was decided to invite other classrooms first and adult guests the following day. The organization of the program followed more or less the way the study had developed--

> Motivation
> Consultation
> Study
> Planning
> Field Trip
> Investigations
> Reports

We put on the board, as the children suggested them, ideas for a tentative sequence for the program which was revised many times. Planning and revising and work on individual parts went on every afternoon for two weeks. A successful program requires sufficient investment of time on an intensive rather than a prolonged basis. During this period each part was presented and criticized by the other children. We structured constructive type of criticism by preliminary discussion and a bit of role playing.

Any creative program involving children changes from day to day, even to the day it is given. A teacher expects this and welcomes the creative spontaneity of children freed from the tension and imprisonment of memorized lines. The children used 3" x 5" cards for notes to help them remember. Some children relied more heavily than others on their notes. The security of the cue cards "in hand" was all most children needed to speak without hesitation.

A child suggested that the program ought to have music---sound effects. When we asked what kind, a child said the opening should be soft and gentle like the beautiful cool green forest before the fire. There should be music which sounded like water rushing down mountain streams. Then there should be loud roaring music for the fire. If we crackled paper, it might sound like flames. There should be sad gloomy music after the fire. But we don't want to leave it sad. There should be hopeful music at the end as the helicopters re-seeded and people replanted seedlings. The music was finally chosen from selections suggested by the Music Teacher. The committee in charge of invitations and hospitality had to be one of the first to go into action. There was a committee in charge of sound effects, the record player, and the tape recorder. The clean-up committee was singled out for the distinction of wearing special arm and head bands bearing the conservation insignia. Committees were set up to organize exhibits on walls and tables.

All experiments were written up and posted on a chart rack. Some experiments had explanatory charts, others had photographs made by the children. Children's questions and answers were written on cards. They were mounted at appropriate spots on the exhibits. The committee also arranged reference materials and made captions where necessary.

The program which follows shows the result of this planning effort.

PROGRAM FOR THE WOODWARDIA FIRE REPORT

Introductory music: The Dove from Respighi's suite The Birds.

Tape recording:

Voice: This is the sound of the mountains (bird calls)

Voice: And this is the sound of the mountains (wind sounds)

Voice: And this . . . . . etc. (children talking about a picnic)

Voice: And this . . . . . etc. (running water)

Voice: And this . . . . . etc. (crackling paper simulating flames)

Voice: FIRE!

Narration: We are going to tell you about a fire, a terrible fire!

Narrator 1 It was October 16th and we were just getting out of school. Who saw the fire! (Class spontaneous responses all together, such as, I saw flames up behind the mountain. I saw smoke, etc.)

Narrator 2 It was indeed a fire. It raged six and a half days in Angeles National Forest, took the lives of two men and millions of animals and cost the taxpayers lots of money. But it cost us a lot more . . . . .

Narrator 3 We studied the fire because it affects us in many ways. We are studying conservation and this fire ties into our study. We are also members of the Junior Fire Department.

Narrator 4 When we decided that we would study the Woodwardia fire, we also decided we would make a model of the fire area.

We started with this contour map of the fire. This model was made from the map. There are lines to show where the elevations are located on the contour map. On our model we used a scale of 1/2" to 1000' and showed the actual land surface features. We traced the 2000, 3000, 4000, and 5000 contour lines onto acetate overlays. We marked the part of the acetate that we needed to trace the contour pattern on plywood that Mr. Corey got for us. After the pieces were cut we covered the pieces with shellac. Once the shellac was dry, we assembled the pieces and tacked them together. Then I took acetate and located the peaks on the wood. We tried four different materials to see which one would work the best for making the mountains on our contour map. We found a mixture of asbestos flakes and starch was best.

Cam located the fire boundaries and outlined them in pencil. We painted the fire area brown, outlined in black, and the rest in green.

New Voice While this was going on we had several class discussions. We decided to go on a field trip to the fire area. We found we could do some experiments. We had fun getting our collecting containers and clip boards together. Each child had his own question or experiment.

Hilary When the class came back from the field trip we all wrote up our impressions. Here are some of the things we wrote:

It seems that the fire jumped some valleys. (Jim)

I could see all the death that went on during the fire. (John)

I know now what it felt like in a dead forest with a graveyard full of many dead things. (Jan)

I saw the top soil washed down on the road and little gullies could be seen on the hills. (Lynn)

It will take many years for all the seeds to take hold and for all the new little trees to grow up. (Russell)

I don't see why people cannot be more careful. (Gregory)

When I saw some deer running in the chaparral it made me feel good because they were safe. (Debbie)

There were a lot of slides on the path we took. (Kathy)

Greg made this book and put our stories into it.

Cecile & Suzie — When Susie and I went up to the fire area, some of the class found burned animal bones. Our school nurse helped us identify some of these bones. This is a back or vertebra bone. The little holes are where the veins go. The big hole is where the main nerve goes.

Jim — The fire not only burned the wood, it burned the rocks and soil. This is a half-burned and half not-burned rock; here is a burned manzanita. Here is some burned topsoil like hard black cement. When the rain comes it won't have a chance to soak in. This is one reason for floods.

Linda & Marlys — Linda and I brought back a big chunk of burned soil and looked at it under the magnifying glass. We made a list of what we found.

sticks (burned and not)
a chunk of burned bark
burned oak leaves
burned rocks (some not burned)
burned pine needles
burned rolled up leaves
some flat leaves
sticks and thorns
sand and dirt
burned acorns
burned berries
charcoal
a seed not burned
skeletons of burned leaves
curled up burned bark
burned chamise
rabbit droppings
ashes
burned seeds
dead insects

Jenny — I found some pine cones on the trip — this is the sugar pine and this is the Coulter. The knobcone pines only open their seeds after a fire. This is a piece of log. It shows tree rings and you can tell how old the tree is by counting the rings. When the rings are close together, the tree was growing slowly. When the rings are far apart, the tree grew quickly, as in good years.

Greg — I did an experiment to find out if chaparral soil would grow plants. I put the soil in pots on January 29, 1960. When I watered it the water went through very easily. The chaparral soil is like a sponge. The soil did grow plants.

Tim — My experiment is to show that the roots of the chaparral ground cover and the oxygen in the soil hold soil together. A fire which burns the roots of the chaparral ground cover also burns the oxygen in the soil. The soil will fall apart and blow and wash away.

Linda & Jerry — Our experiment was to find out if burned soil had changed chemically. We first used red and blue litmus paper to test for acid or alkali. In vinegar (acid) blue litmus turned pink. In soda (alkali) red litmus turned blue. On our trip we collected samples of the soil. Linda took the burned soil and I took the chaparral soil. Back at school we put water in them and shook them up. Two days later we put the blue litmus paper in the burned soil solution and it stayed blue. We put the red litmus paper in the solution and it turned blue. That meant that the burned soil is alkali. We did the same thing with the chaparral soil and it was acid.

Cecile — My experiment was to find out if anything was growing in one square foot of burned area after the fire. The planes has dropped rye and mustard seed soon after the fire. But a few days later a great wind came and blew the seed away. The ranger told us this. Very little grew.

John — We set out to find the temperature in the exposed and unexposed areas. I took the ground temperature under the chaparral ground cover and in the burned soil. I took temperatures with this thermometer by sticking it in the ground. In the chaparral in the sun, the temperature was 45.4°; in the shade it was the same because the brush shaded out most of the heat. In the burned area in the sun it was 51.8°, in the shade it was 46.40°. The air temperature in the burned area was 62.6°F. Then I took the air temperature in the chaparral; it was 59°F. I took the temperature every 15 minutes.

Christy — This is a weather-vane that I made to find the wind direction. I used a compass to find North. I found that most of the wind came from the Northeast.

Linda — Jane and I planted a tree at the Ranger Station. I made this speech:

> "We, Mrs. Elgin's fifth grade class, at Paradise Canyon School, in nearby LaCanada, are happy to plant this tree as our contribution towards rebuilding this part of Angeles National Forest."

Russell — I made a report on the chaparral before it was burned. The chaparral is made up of hard, tough, woody plants that grow low and close together. Little weak plants could not live there because of the heat. Here are some pictures of plants in the chaparral.

Jane — Sherry, Kathy, and I are going to tell you how this terrible fire can affect our watershed. We are going to show you some of the things that can happen after a watershed fire. There are many more.

Jane — "I'm a sloshy, slushy, muddy lake and the fish and plants that live from my waters will die because there isn't any good water, splash, splash, splash---."

Sherry — "I'm a little rabbit and I can't find any places for a home. The home I had was very good but it was burned and now I have no place to go. Oh, what shall I do, where shall I go?"

Kathy (bends lower) — "I used to be a beautiful stream. But after this fire I am getting lower and lower. Pretty soon I'll be only mud."

Jane — "I'm a piece of bare cold soil. My brothers and sisters have already been blown down the big hill and pretty soon I will too. Oh--o--o here I go--o--o--."

Sherry "I'm some rain water and I'm rushing down the side of the hill because there is no watershed to stop me. Pretty soon I'll run into big floods and make people unhappy because I'll ruin their homes because there's no watershed to stop me. Whee---ee---ee!"

Kathy "I used to be a beautiful reservoir, filled with clear, sparkling water. But after this fire I am all choked up and muddy!"

Jane "I'm a little plant and my ground cover is lost, my roots can't hold me in this soil any more. Pretty soon I will blow away. Oh! Here I go-o-o!"

Sherry "I'm a little squirrel and I'm looking for some food, but I can't find any because it's all burned up. Now I'll die because of lack of food."

Kathy "Ouch! What was that? I used to be a beautiful tree. But this fire has burned half of me and the other half of me will soon be destroyed by insects and disease. Ouch! Drat that bug!"

Jane "I'm a fish (gulp, gulp, gulp) I can't find any oxygen in this muddy lake which used to be good, clear water. Pretty soon I will die. (gulp, gulp, gulp)"

Sherry "I'm a little burned tree. I used to be beautiful and tall and had great big green leaves. My trunk could be used for wood. But when the fire came it burned me and now I'm a useless old stick."

Kathy "Oh, I'm angry! I'm a taxpayer. I'm angry because I have to pay taxes for the fire. I don't even live near the fire area. Oh taxes!"

Mike This fire did a lot more than burn all the brush and blacken the mountains. It destroyed the beauty and it will be years before it will be back again. (Holds up clod of soil bearing grass) Look at this piece of soil, it is worth its weight in gold. We would like to share with you a quotation from the book, "Cry, the Beloved Country" which we found in the book, "The Web of Life."*

> "The grass is rich and matted, you cannot see the soil. It holds the rain and the mist, and they seep into the ground, feeding the streams in every kloof. It is well tended, and not too many cattle feed upon it; not too many fires burn it laying bare the soil. Stand unshod upon it, for the ground is holy, being even as it came from the Creator. Keep it, guard it, care for it, for it keeps men, guards men, cares for men. Destroy it and man is destroyed."

Music -- End of "Neptune, the Mystic" from Gustav Holst's The Planets Suite.

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*Ref. - Paton, Alan - Cry the Beloved Country
Storer, John H. - The Web of Life

Visit to: _____ Name _____

_____ Date _____

Here are the questions you have discussed and asked about. Remember, that your most important responsibility is for your particular question. Put your notes down simply, as you have been taught. You will report back to class. (You are allowed to find out all answers if you like.)

1. What are the most obvious results of this fire?
2. What are the less obvious results of this fire?
3. What type of fire was it and how did the winds affect it?
4. How did animals help or hinder fire-fighters?
5. What is a watershed?
6. How did the fire damage the watershed?
7. What effects might this have?
8. How did the fire-fighters get heavy equipment up slopes?
9. Where did the water come from?
10. How are permanent water-tanks filled? (in mountains)
11. Did the soil get burned? Was it changed?
12. When the fire was out what was done first?
13. What are some ways the Forest Service will try to stop the bare soil from washing and blowing away?
14. Why did we get such large ashes, burned leaves, etc. falling on our schoolyard?
15. What kind of seed was used to re-seed the area and why was it selected?
16. Does chaparral type ground cover make it easy for the fire to advance quickly?
17. After fire weakens trees that aren't entirely burned, what new enemy can come along to kill them?

Can you think of more questions?

1. _____

2. etc. _____

Here are some of the things the class suggested that we observe:
(or prepare for experiment)

\# 1. If we have much rain, are there many steep slopes which will make the rainwater "run" off the land instead of "walking" off?
\# 2. How much ground cover is left in the fire area?
\# 3. How much erosion has begun already?
* 4. How deep is the topsoil? (at a certain place? two places?)
\# * 5. Are there new things beginning to grow? What new things?
* 6. Did the fire change the soil?
* 7. Is the temperature of the soil the same on burned and not burned areas? (both in shade and sun)
\# * 8. Look at soil, some crumbles easily, some holds together, some "packs", some is fine, some is coarse, there are different colors.
9. What impresses you most?

_____

* experiment?

_____

\# photograph?

_____

Woodwardia Fire Report - Program Order

Marc	Music
Jeff W.	Tape
Marlys	Introduction
Jeff W.	Introduction
Lynn	(cont.)
Janet	(cont.)
Jeff, Cam, Joan, Greg, Tim	contour map model, etc.
John T.	(script)
Hilary	Impressions of fire area
Cecile, Suzie	bone committee
Jim	burned soil, wood, etc.
Marlys, Linda	contents of burned soil
Jenny	cones, Coulter, sugar-pine (germinate after fire)
Russell, Greg W.	expt. growth
Tim	expt. soil compaction and air
Jeff J.	chamise expt. (germination after fire)
Jenny, Linda	expt. acid/alkali test
Debby, Jan	expt. living things
Cecile	expt. seed growth in 1 sq. ft.
John T., Cam	expt. ground temperatures
Christy	expt. wind directions
Janet, Lynn	expt. topsoil
Janet, Lynn	equipment and burned acreage
John, John, Cindy, Richard	equipment and supplies
Mike, Linda	photographs
Linda	tree planting
Russell	chaparral
Jane, Sherry, Kathy	burned watershed effects
Jim	remarks to audience
Mike	Conclusion
Marc	Music

Appendix - C

Materials Displayed on Wall

Pictures from Los Angeles Fire Service (photographs of fire line fighting, planes dropping borate solution, reseeding burned areas).

Pictures from Los Angeles Fire Service (aerial photographs of fire).

Sample of mustard and rye seed used to re-seed.

The master contour overlay map (2000' -- 5000' elevation).

Contour map (U.S. Geological Survey) compiled by Fire Department and using three quadrangles of the San Gabriel Mountains and Woodwardia fire area.

Information regarding equipment used, type of fire.

Information regarding break-up of burned areas (areas of administration, etc.)

Charts made to dramatize effects of fire (experiments and results-----deductions).

Photographic record of steps in making model, children on field trip, erosion in burned area, new growth, classroom experiments, etc.

Selection of sentences from impressions.

Chart showing conservationally ideal areas and poor areas resulting from fires, etc. (inspired by conservation chart).

Scale model of contour map, on table before map and having strings to matching features.

Appendix - D

Materials Displayed on Tables and Racks

Small log showing tree rings.

Sugar and Coulter pine cones (germination after fire).

Chart rack, answers to children's questions if not on wall display.

Booklets: Class Impressions (of fire area)
Equipment used in the fire
Booklet Chaparral (a study)
Field Trip Plans

Collection table: burned wood, rocks, soil, things found from analysis of soil, seed pods.

Collection of burned animal bones (identified as to type only — leg, jaw, vertebra).

Display newspaper pictures of fire.

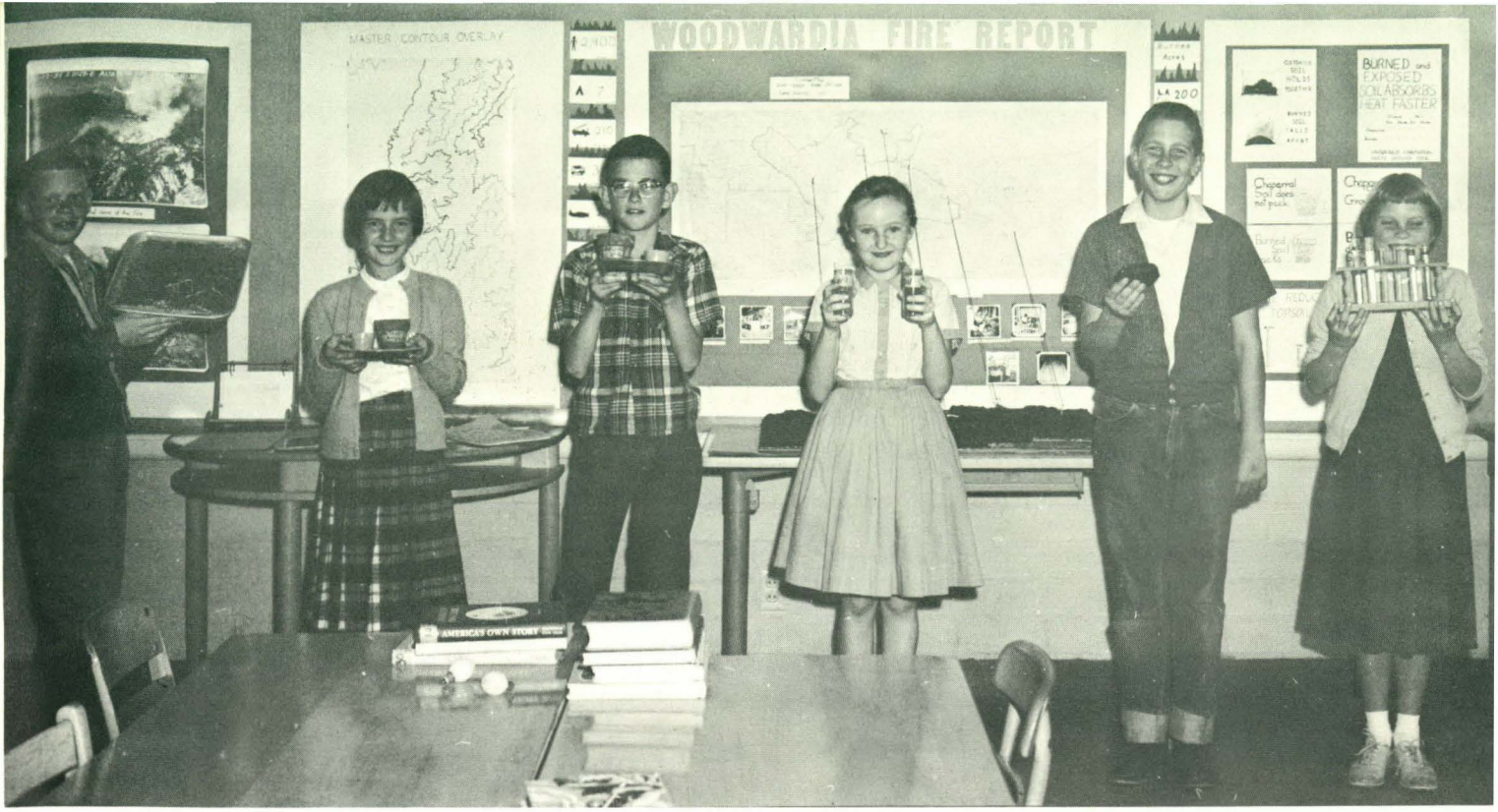
Experiment equipment table (growth experiment, soil acid and alkali tests, samples, etc.)

Chart rack, all experiments written up.

Table containing resource materials, microscope with soil slide, ground thermometers.

Chart rack, pictures found, special drawing reports such as, How a Tree Grows.

Home made weather vane (State Science Book, Gr. V- Schneider, Herman and Nina, Science in Our World, D. C. Heath & Co., 1959).



CULTIVATED SOIL HOLDS TOGETHER
BURNED SOIL FALLS APART
BURNED and EXPOSED SOIL ABSORBS HEAT FASTER
UNBURNED CHAPARRAL KEEPS GROUND COOL
ON THE WAY UP
BURNED BRUSH
NEW GROWTH
PLANTING A TREE
SIGNS OF EROSION
Interesting things found in burned ground
Yucca Seed Pods
Cherries seeds and galls
The Wood Before the Fire Is Brown Leaf Ash
After the Fire Burned the Wood, It Made A Charcoal Block

Photos courtesy Los Angeles County Fire Department.

SMOKEY
PLEASE BE CAREFUL...
with matches
with smokes
with campfires
with every fire!
SMOKEY
Remember-Only you can
PREVENT
FOREST FIRES